



## A modeling approach to forecast the effect of long-term climate change on lake water quality

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### Abstract:

The long-term effect of global warming on environmental variables, such as water temperature, dissolved oxygen and nutrients as well as aquatic ecosystems was assessed. The developed watershed runoff model and reservoir water quality model with meteorological input calculated by a GCM A2 scenario is applied to Shimajigawa reservoir located in western Japan. To evaluate the sensitivity and long-term effects of climate change on water quality and aquatic ecosystems, we compare the simulated results of the lake model obtained for 1991-2001 with those obtained for 2091-2100. The 10-year average of surface water temperature in the 2090s was predicted to increase by about 3.4 °C compared with in the 1990s. The surface water temperature is expected to increase by 3.8 °C and the water temperature of the hypolimnion by 2.8 °C. As a result, higher temperatures expected to expand the thermal stratification period, and deepen the thermocline. This change might also lead to an increase in oxygen demand for aerobic decomposition, and promote an upward flux of phosphorus from sediments, increasing the concentration and amount of phosphorus in the hypolimnion. In Shimajigawa reservoir, phosphate release from sediments under anaerobic conditions is spread to AAE layer by the vertical diffusion and is transported to the epilimnion by the turnover, causing phytoplankton growth in the epilimnion. Based on long-term prediction using water quality model global warming were shown to cause more trophic lake conditions, further promoting algal growth and changing the aquatic ecosystems. © 2007 Elsevier B.V. All rights reserved.

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### Resource Description

#### Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

**Special Report on Emissions Scenarios (SRES) Scenario:** SRES A2

#### Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality, Temperature

#### Geographic Feature:

# Climate Change and Human Health Literature Portal

resource focuses on specific type of geography

Freshwater

## **Geographic Location:**

resource focuses on specific location

Non-United States

**Non-United States:** Asia

**Asian Region/Country:** Other Asian Country

**Other Asian Country:** Japan

## **Health Impact:**

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

## **Mitigation/Adaptation:**

mitigation or adaptation strategy is a focus of resource

Adaptation

## **Model/Methodology:**

type of model used or methodology development is a focus of resource

Exposure Change Prediction

## **Resource Type:**

format or standard characteristic of resource

Research Article

## **Timescale:**

time period studied

Long-Term (>50 years)

## **Vulnerability/Impact Assessment:**

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content